

## Bone Marrow Mesenchymal Stem Cells to Heal Chronic Diabetic Wounds

### Grant Award Details

Bone Marrow Mesenchymal Stem Cells to Heal Chronic Diabetic Wounds

**Grant Type:** Early Translational II

**Grant Number:** TR2-01787

**Project Objective:** The project objective is to develop a bone marrow-derived MSC within a scaffold for dermal regeneration (Integra™ Matrix, SDR) for the treatment of diabetic skin ulcer.

**Investigator:**

**Name:** Roslyn Isseroff

**Institution:** University of California, Davis

**Type:** PI

**Name:** Jan Nolte

**Institution:** University of California, Davis

**Type:** Co-PI

**Name:** Jose Egana

**Institution:** Technische Universität München

**Type:** Partner-PI

**Disease Focus:** Skin Disease

**Collaborative Funder:** Germany

**Human Stem Cell Use:** Adult Stem Cell

**Cell Line Generation:** Other

**Award Value:** \$4,629,747

**Status:** Closed

## Progress Reports

---

**Reporting Period:** Year 1

**View Report**

**Reporting Period:** Year 2

**View Report**

**Reporting Period:** Year 3

**View Report**

**Reporting Period:** Year 4

**View Report**

---

## Grant Application Details

**Application Title:** Bone Marrow Mesenchymal Stem Cells to Heal Chronic Diabetic Wounds

**Public Abstract:** Diabetic foot ulcers (DFU), chronic, non-healing wounds on the feet of diabetic patients, present a serious challenge to global health. These ulcers affect between 15-25% of the 18-21 million Americans who have diabetes (world-wide incidence of diabetes: 366 million people). DFUs have a huge impact on our health care system, not only in terms of economic cost, but also from a psychosocial perspective, associated with significant morbidities, decrease in quality of life, prolonged hospitalization and importantly, often result in the amputation loss of lower extremity. In the United States, persons with diabetes are at twice the risk for amputation compared to non-diabetic individuals. According to recent census, DFU is the leading cause of lower limb amputation and greater than 85% of amputations are preceded by an active foot ulcer.

Treatments for curing DFU are very far from optimal. Current standard of care can cure only about 30% of DFU and even the most advanced therapies, cell-based devices containing skin-derived keratinocytes and fibroblasts, boost the cure rate only to about 50%, leaving a tremendous unmet need for new effective cures for DFU.

The research that we propose with our collaborative partners in Germany is directed specifically at this problem. The candidate device is a combination of mesenchymal stem cells that have curative powers, and secrete potent stimulatory molecules, coupled with a collagen scaffolding creating a template upon which new tissue can be rebuilt and regenerated. The combined mesenchymal stem cell- scaffold device will be pre-conditioned so that its reparative properties are maximized. Testing of the material will occur in animal models that closely mimic the human DFU condition, so that the results can be reliably translated to a human curative product. The product will come to the clinic as living mesenchymal stem cells embedded in the pre-optimized scaffolding. All the treating physician will need to do is rinse the bandage-like material and apply it to the wound. Based on our preliminary studies that have examined the potent healing and revascularizing effects of MSC on damaged tissues, we anticipate that rapid healing will ensue.

**Statement of Benefit to California:**

While the number of individuals with all forms of chronic wounds is increasing in the general population, particularly with the rise of diabetes and aging of the population, the number of individuals affected by diabetic foot ulcers (DFU), the target disease for the development candidate in this proposal, is increasing in California at an alarming rate. That is because the prevalence of type 2 diabetes is now increasing within the state of California to epidemic proportions. In 2002, over one million California adults age 45 and older were diagnosed with diabetes, and by 2005 that number had risen to 1.5 million: 5.9% of the California population. For reasons that are not all that clear, there are marked differences in the prevalence of diabetes in different Californian ethnic and racial groups. Among Californians 65 and older, diabetes is significantly more common in African Americans (25.6%) , and Latinos ( 24.4%) as compared to caucasians (12.2%). (1) The diabetes brings with it devastating health impacts: it is the sixth most common cause of death in the United States. Among the morbidities associated with diabetes, DFU is one of the most debilitating. Approximately 15-25 percent of patients with diabetes will develop DFU, and of those, six percent will be hospitalized due to infection or other ulcer-related complication. According to a recent census, DFU is the leading cause of lower limb amputation and greater than 85% of amputations are preceded by an active foot ulcer.

Sadly for our state, we lead others in the US in the prevalence of DFU: "Of the 45 areas (44 states and DC) that reported information from the BRFSS diabetes module, Indiana (16.3%), California (16.2%), and Nevada (16.2%) had the highest age-adjusted prevalence of a history of foot ulcer among persons with diabetes, and Colorado (7.4%), Wisconsin (8.8%), and Hawaii (8.9%) had the lowest " (2).

Treatments for curing DFU are very far from optimal. Current standard of care can cure only about 30% of DFU and even the most advanced therapies, cell-based devices containing skin derived keratinocytes and fibroblasts, boosts the cure rate only to about 50%, leaving a tremendous unmet need for new effective cures for DFU, particularly in California. We anticipate that the development candidate that we propose, a stem cell-based "biological bandage", will bring such a new and effective cure to our citizens who are suffering from diabetic foot ulcers.

Sources: 1) California Health Care Survey, UCLA, <http://www.chis.ucla.edu/>  
2) CDC reports Morbidity and Mortality Weekly Report (MMWR),  
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5245a3.htm>

---

**Source URL:** <https://www.cirm.ca.gov/our-progress/awards/bone-marrow-mesenchymal-stem-cells-heal-chronic-diabetic-wounds>